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mononeuric, dineuric or polyneuric. For the branches of neurons, Cajal's term, collaterals, is adopted. While thus distinguishing between these two kinds of processes, the author frankly states that "it is impossible to say positively that there is any essential difference between the neurons and dendrons." Neurons and dendrons end finally alike in terminal arborizations; and this fact is taken to support the view that the structure of the axis-cylinder is fibrillar. The length of a neuron before breaking up into its terminal arborization has proved serviceable for purposes of classification. Upon this distinction Golgi based his classification into "motor" and "sensory." Objections have accumulated against this classification to such an extent that the author deems it necessary to substitute for Golgi's cell of the first type projection-cell, and intermediary-cell for "central," or cell of the second type.

The more important views advanced in the paper may be gathered from an abbreviation of the seven conclusions: 1. "That every nerve-cell forms a structural element which is anatomically isolated from, but in physiological continuity with other nerve-cells." 2. "That the physiological continuity of these elements depends on the contiguity either of the ramified cell processes of different nerve-cells with one another or of the ramified processes of one cell with the body of another cell." 3. "That the same nerve-impulses do not necessarily pass from one element of a nerve-chain to the next, but that more probably new impulses (often of different rhythm) are generated in the successive elements of the chain." 4. The converse of 3. 5. "That either the body of the cell or any of its processes may be concerned both with the starting and with the transmission of nerve-impulses; and, that these may originate by acts of contraction, causing waves of pressure or variations of surface-tension to traverse the fibrils." 6. "That the body of the cell is especially concerned with presiding over the nutrition of the whole cell-element; this trophic function being intimately associated with the presence of the nucleus. Nevertheless nerve-impulses may both originate in and be conducted by the cell-body. The dendrons or protoplasmic processes, being extensions of the protoplasm of the cell, may primarily serve to assist in the nutritive processes, as was supposed by Golgi, but they undoubtedly also, like the cell-body itself, may in some cases convey nerve-impulses." A. 7. "That the ordinary centrifugal paths are blocked for centripetal impulses, although the centripetal paths may convey centrifugal impulses, this physiological difference being correlated with a difference of anatomical relationship at the junction of the respective cell-elements."

The figures are culled from best sources, new and old, from M. Schultze, Ranvier, Cajal, Retzius, Lenhossek; and these are supplemented by original diagrammatic compilations, which add clearness to the subject.

Zur Frage über den Bau der Nervenzellen und über das Verhältniss ihres Axencylinders (Nerven) Fortsatzes zu den Protoplasmafortsätzen (Dendriten). A. S. DOGIEL. *Archiv für Mikroskopische Anatomie*, Bd. 41, S. 62-87, Taf. IX. and X. Bonn, 1893.

Zur Frage über das Verhalten der Nervenzellen zu einander. A. S. DOGIEL. *Archiv für Anatomie und Entwicklungsgeschichte*, 1893, S. 429-434, Taf. XVI.

These papers are the latest in a series of six which have appeared from the above writer since 1888. Their chief interest in the present connection attaches to the strong evidence which Dogiel has

been able to bring forward for the direct anatomical continuity of nerve-cells through their dendrons. Nerve-cells, as he finds them in a number of retinæ of different animals, are not isolated elements, as is generally taught at present, but cells usually of similar types are joined by their dendrons into cell-colonies. Further an axis-cylinder may arise in three ways: a, from the cell-body direct; b, from the network formed by branching of neurons; c, from the network of dendrons. The method employed, methyl blue staining, exhibits a difference between neurons and dendrons similar to that by the Golgi method. But since fibrillæ from these processes may unite to form an axis-cylinder, they must be unconditionally considered to be of "Nervennatur." Thus far the author's work has been confined to the retina; but there is no good reason for supposing that relations of cells are different here from their relations in other parts of the central nervous system. This work, therefore, if confirmed, must negative the accepted doctrine of isolated cell-elements.

A Physiological, Histological and Clinical Study of the Degeneration and Regeneration in Peripheral Nerve Fibers after Severance of Connections with the Nerve Centers. W. H. HOWELL AND G. C. HUBER. *Journal of Physiology*, Vol. XIII. 1893, pp. 335-406; Plates XII. to XVI.

The above paper was awarded a prize offered by the American Physiological Society for the best essay upon the subject. The chief object of the research was to test experimentally the possibility of "union by first intention" of a nerve severed from its central connections; together with a thorough study of histological steps in processes of degeneration and regeneration. Dogs were used in all but one experiment, which was made upon a rabbit, and the ulnar and median nerves were either cut, cut and sutured, crushed by a ligature, immediately loosened, or coagulated by contact with a tube, through which water at 80° was allowed to flow. The first result to be noted is that in no case did "union by first intention" take place. In all the experiments degeneration of the peripheral end was complete through its entire length. Certain authors have described experiments in which both sensory and motor functions became re-established in a severed nerve in a few hours. In these experiments the least time in which irritability began to return to parts peripheral to the cut is twenty-one days; and at this time regeneration is found to have progressed some distance beyond the wound. Sensory nerves regain function before motor. Both sensory and motor function is found to be imperfect at the end of seven weeks and nearly normal by the end of eleven weeks.

The histological evidence as to the processes concerned has been made quite complete and is well illustrated by seventy-six figures. This evidence favors the view that embryonic fibers form in the distal nerve and subsequently unite in the cicatrix with the axis-cylinder as it grows out from the central end.

Histogenesis of the Retina in Amblystoma and Necturus. F. MALL. *Journal of Morphology*, Vol. VIII. pp. 415-432; 12 Figs. 1893.

The above paper fills a long-felt need by giving in a brief form a clear orientation of the layers and elements of the retina. Two principles of universal application to the growth of nerve tissue are stated at the outset. These are: 1. "The primitive growing point of all vertebrate nerves is in the layer of cells on the outermost side of the ectoderm, and the axis of division is parallel